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DIRECT AND SPILLOVER EFFECTS OF REGIONAL FDI ON EMPLOYMENT OPPORTUNITIES IN TUNISIA: A SPATIAL PANEL DATA APPROACH

FOUED BEN SAID & HANEN BEN OUADA JAMOUSSI

ESCT, University Manouba, FSEG Tunis El Manar University, Tunis, Tunisia

ABSTRACT

This study analyzes the regional determinants of the foreign direct investment FDI and its impact on local employment opportunities. The economic indicators are constructed using panel data on employment created by the regional FDI, the sector's structure and the telecommunication infrastructure development level for 24 Tunisian governorates covering the period 2004-2013. The panel SDM model specification is used for controlling the spatial dependence and unobservable spatial and time heterogeneity. The estimation results of direct, indirect or spillover and total effects of FDI, reveal that, it has a positive direct effect and a positive regional spillover effect inducing a total positive effect on employment. The sector specialization indexes show that the spatial clustering of manufacturing firms and construction sector firms exert a positive spillover effect on employment in the nearby regions. Positive direct effect, spillover and total effects of the diversity index imply that employment opportunities tend to be created in governorates with fewer sectors' diversity. Telecommunication infrastructure development has positive externalities on employment in the nearby regions that become more attractive for FDI.

KEYWORDS: Foreign Direct Investment, Employment, Telecommunication Infrastructure, Spatial Panel Model

JEL CODE: C21, O10, R12

1. INTRODUCTION

According to UNCTAD statistics, "Tunisia is the third largest holder of FDI stock in North Africa, after Egypt and Morocco. It is also the largest holder of FDI stock in relation to the size of its economy. Tunisia's $31 billion in FDI stock is equal to 71% of the country's GDP".[1] The strategic location of Tunisia on the Mediterranean, favors its access to the international capital market. Its proximity to European and Middle Eastern cities makes it a preferred site for investors who choose access to more than 800,000 consumers. In addition to this geographic trump, the economic environment is adapted to be competitive and mobilize more Foreign Direct Investment (FDI). Foreign firms have begun to establish themselves in Tunisia since 1970, reaching 3,160 firms and creating more than 330,000 jobs by 2013.[2] Benefiting from comparative advantages in highly skilled human capital and modern infrastructure, Tunisian authorities intensify and multiply reforms and incentives, in order to present a favorable investment framework. To promote and protect FDI inflows, Tunisia signed 52 bilateral agreements on double taxation and several bilateral and multilateral agreements establishing free trade zones with the Middle East and North African countries (FIPA; 2013).[3] After the January 14th

[1] Mr. Mukhisa Kituyi, Secretary-General of United Nations Conference on Trade and Development UNCTAD (2014). http://unctad.org/en/pages/SGStatementDetails.aspx?OriginalVersionID=107
[2]Tunisian Foreign Direct Investment Agency document " Invest In Tunisia" (2013).
[3]Op cit

revolution, the FDI flows, the essential channel for job creation, are weakened. The total number attracted in 2013 was approximately DT 1994,3 million and the number of jobs created was 9715 jobs against DT 2417,1 million attracted in 2010 and 15346 jobs were created.[4] The ventilation of FDI by the sector of activity in 2013, ranks energy first, with 59.36 % of the total FDI; followed by the manufacturing sector, with 28 % of the total FDI; then the service sector, with 12 % of the total FDI and finally, agriculture, with 0.63 % of the total FDI. The FDI/GDP ratio declined from 3% in 2010 to 2% in 2013, due to the economic climate uncertainty that dominated the transitory period post-revolution (World Bank Indicators). Tunisian authorities strongly believe in the major role of FDI to support growth, jobs and export, and contribute to reducing regional disparities, which is they need to realize deeper economic reforms to leverage FDI inflows and improve the attractiveness of further FDI inflows to potential sectors and activities. The advantages of FDI to pick up economic indicators depends on the efforts undertaken in the implementation of modern infrastructure, human capital enhancement, and the liberalization of potential sectors. Belloumi (2014) in an empirical study on the dynamic relationship between FDI growth and trade in Tunisia showed that economic growth and trade promote FDI in the long term, but no significant causality between these variables in the short run. The FDI attracted to the local economy has no significant spillover effect on productivity.

Ghali and Rezgui (2011) analyzed the impact of FDI on firms' technical efficiency. They conclude that the FDI contribution to technical efficiency relies mainly on firms' internal organization and absorptive capacities. Their results showed that FDI presence at the firm level has a positive effect on its technical efficiency. However, horizontal FDI spillovers are insignificant while sectoral export activity represents a potential source of technology spillovers for local firms. Karray and Driss' (2009) investigation of the role of FDI in increasing regional growth concluded that at the regional level, FDI contributes to generating growth by creating employment.

In this context, the present empirical study aims, to consider the regional and local aspects of the spin-off of FDI on employment opportunities created at the local level, by estimating a spatial Durbin panel model (LeSage and Pace, 2009; Elhorst, 2014) that provides evidence of spatial spillovers arising from, intra-regional economic structure, the regional FDI amount attracted and the regional development level of telecommunication infrastructure. The introduction of spatially lagged dependent and independent variables in the model allows for the examination of the existence of spatial spillovers. Several recent studies, (Torero and al, 2007; Kok and Ersoy, 2010) addressing the issue of the impact of telecommunication infrastructure on FDI, confirmed that communication is the most determinant variable of FDI. This study aims to go beyond this growing empirical literature by the investigation of the impact of FDI on employment at the regional level, by considering variables that reflect the regional sector' structure, regional infrastructure level and spatial spillover effects, modeled by a spatial time panel model. The regional indicator of the infrastructure development level tested is the fixed phone and mobile density. The paper has been organized as follows. A brief introduction is given in Section I while the review of literature is presented in Section II. Section III describes the econometric model, section VI presents the study area and data, followed by empirical results. Section V provides concluding remarks and policy implications.

II. LITERATURE REVIEW

Economic literature has exhibited a growing interest in assessing the impact of FDI on the economic growth of the

[4] 1DT = 0.615 USD = 0.463 EUR

host countries. Solows's (1957) pioneering framework called "Slow growth accounting" constitutes the basis of the recent models that explain the growth of production output caused by FDI inflows along with other input factors. By developing the Solow model, which assumes that the diffusion of technology increases with FDI, Findlay (1978) postulated that technology progress transferred to the host country's firms by foreign firms, would promote economic growth in this country. The endogenous growth model (Romer; 1986, Lucas; 1988) assumes that the level of technological transfer depends on a set of inputs, and that FDI affects economic growth via the channels of human capital and of research and development. Grossman and Helpman (1991) argued that an increase in innovation accelerates technological progress, affecting productivity and increasing long-term economic growth. FDI inflows create dynamic comparative advantages that promote long-term economic growth, but the extent to which this occurs, depends upon the initial capital investment and the absorptive capacity of firms in the host country (Borensztein et al, 1998). This explains why actual FDI is oriented toward the manufacturing and service sectors rather than to the primary sector (Pami and Aneesa, 1998).

In a pioneering empirical investigation Borensztein et al. (1998) found that FDI outflows from OCDE countries to developing countries had a positive effect on economic growth. They found that FDI is an important vehicle for the adoption of new technologies, contributing relatively more to growth than did domestic investment. Bulasubramanyam et al. (1996) found that FDI will increase the growth of countries that adopt an export promotion policy. Ajaga and Nunnenkamp (2008) analyzed the long-term relationships between inward FDI and outcome variables, such as value added and employment, at the level of US states. They found cointegration as well as two-directional causality between FDI and outcome variables. Ndikumana and Verick (2008) investigated a key channel of the impact of FDI on development through its effects on domestic market factors, especially on domestic investment and employment. In this context, they analyzed the two- way linkages between FDI and domestic investment in Sub-Saharan Africa. Their results suggested that first, FDI crowds in domestic investment, and, second, that countries will gain much from measures aimed at improving the domestic investment climate. Sadik and Bolbol (2001) studied the impact of FDI on total factor productivity (TFP) in six Arab countries (Egypt, Jordan, Morocco, Oman, Saudi Arabia and Tunisia) for the period 1978-1998. They found that FDI has a significant negative impact on TFP in Tunisia, Egypt and Saudi Arabia. They explained their results by stating that the amount of FDI was insufficient to produce significant positive spillover effects. They also stated that there were some indications that the effect of FDI on TFP had been lower than domestic investment, indicating a possible crowding-out effect. Bashir (2001) tested the relation between FDI and GDP per capita in six south Mediterranean countries (Algeria, Egypt, Jordan, Morocco, Tunisia, and Turkey) for the period of 1975–1990 using an endogenous growth model. The estimation of a random effect model showed that the impact of FDI on economic growth is positive but not significant. Bashir explained that by the weakness of FDI inflows captured by these countries during the 1970s and 1980s. Bende-Nabende and al (2001) studied the impact of FDI through spillover effects on economic growth of the ASEAN-5 for the period 1970-1996. they found that FDI accelerates economic growth either directly or through spillover effects. Furthermore, they showed that the impact of FDI on economic growth is positively signed and significant for Indonesia, Malaysia, and the Philippines, while they identify a negative relationship for Singapore and Thailand. Similarly, Marwah and Tavakoli (2004) tested the effect of FDI on economic growth in Indonesia, Malaysia, The Philippines, and Thailand. Using time series annual data over the period 1970-1998, they found that FDI has positive correlation with economic growth in all four countries.

In their empirical study on the impact of the Tunisian industrial structure, the agglomeration effects and the economic openness, on regional growth, Karray and Driss (2009) showed that a competitive environment and a diversity of

the industrial activities would be favorable to the regional growth. This study concluded that the impact of FDI on economic activities they found that foreign direct investments play an important part in the development of concentrated areas.

Belloumi (2014) examined the dynamic causal relationship among the series of economic growth, foreign direct investment, trade openness, labor, and capital investment in Tunisia for the period of 1970– 2008. He found that there is cointegration among the variables specified in the model when FDI is the dependent variable. He, also, concluded that long-term FDI inflows were promoted by trade openness and economic growth.

Amara and Ayadi (2014) estimated dynamic spatial panel model on five manufacturing sectors associated to 138 Tunisian coastal small localities (delegations) covering the period (2002–2007). Their results showed that spillovers have been found to be significantly effective only within a range of 15 km for high-tech industries and 50 km for low-tech. They found that activity concentration and diversity have a positive effect on the local growth of employment in the manufacturing sector; however, competition has a negative effect.

In recent years, the role played by telecommunication infrastructure in promoting FDI attractiveness has attracted considerable attention. Lyond and Williams (2005) showed that average FDI inflows into developing countries are greater in countries that have better telecommunications networks. They found that both fixed and mobile communications networks are positively linked with inward FDI. Kok and Ersoy (2009) concluded, in their study conducted to identify the FDI determinants, that the communication infrastructure is the most determinant of FDI. A wide range of recent empirical studies relating FDI to telecommunication infrastructure, have concluded the density of fixed phone mainlines exerts a major influence on FDI attractiveness (Sakkat and Veganzones, 2004; Asiedu, 2006 and Rehman and al, 2011).

III. THE ECONOMETRIC MODEL

In order to analyze the impact of regional FDI on regional employment, an unconstrained spatial Durbin model with spatial fixed and temporal effects is used. The spatial Durbin model (SDM) includes both a spatially lagged dependent variable and spatially lagged explanatory variables (Elhorst et al, 2006; Ertur and Koch, 2007; LeSage and Pace, 2009). The SDM panel model is characterized by its flexibility in modeling spatial spillover effects, taking into account spatial and time heterogeneity (Elhorst, 2010):

$$\boldsymbol{y_{it}} = \boldsymbol{\delta} \sum_{j=1}^{N} \boldsymbol{W_{ij}}\, \boldsymbol{y_{it}} + \boldsymbol{\alpha i_N} + \boldsymbol{x_{it}\beta} + \sum_{j=1}^{N} \boldsymbol{W_{ij}}\, \boldsymbol{x_{it}}\, \boldsymbol{\gamma} + \boldsymbol{\mu} + \boldsymbol{\xi_t i_N} + \boldsymbol{\epsilon_{it}} \quad (1)$$

$\mu=(\mu_1 \ldots\ldots \mu_N)^T$

where i is an index for the cross-sectional dimension (spatial units), with i=1,...,N, and t is an index of the time dimension (time periods), with t=1,...,T

δ is called the spatial autoregressive coefficient and w_{ij} is an element of a spatial weights matrix W describing the spatial arrangement of the units in the sample.

The spatial weights matrix is based on the inverse distance between region i and j such that:

$$\begin{cases} w_{ij} = \frac{1}{d_{ij}} & if \;\; d \leq d_{max} \\ 0 & otherwise \end{cases}$$

d_{max} *is the cut-off* distance, in this study the cut-off distance was the average nearest neighbors distance.[5] The use of a cut-off distance produces a sparce weighted matrix that limits the spillover influences to only regions nearby (LeSage, 2014).

DATA AND EMPIRICAL RESULTS

Study Area and Data

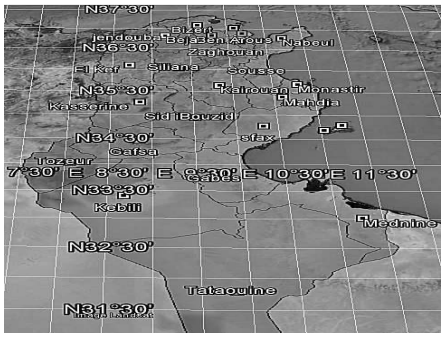

Figure 1: Tunisia Geographic Location

Tunisia, the study area, is located in the Northern Africa and lies between latitudes 31° 0' N and 37°, 2’ N, and longitudes 7°,3 'E and 11°,3’ E (Map1) . Tunisia is subdivided into 24 governorates and Tunis, the northern biggest city is the economic and political capital town of the country.

Data and Descriptive Statistics

Data used in this study are collected from the Agency of Foreign Investment Promotion (FIPA) and National Institute of Statistics (INS). Data on regional FDI and employment created by FDI covering the period 2004-2013, are collected from the FIPA. Data on enterprise characteristics are collected from the national enterprise repertory published yearly by the INS. Data on telecommunication infrastructure indicator are collected from the annual infrastructure rapport (INS). Descriptive statistics of the study variables by region and over the period are presented respectively in (Appendix1) and (table1):

Table 1: Descriptive Statistics of the Study Variables

Year		FDI	Employ	Foreign_Firms	TELE_DENS	Firms_Manufact	Firms_Construct	Firms_Commerce	Hotel_Restaurant	Transport
2004	$\bar{x}$	6,903	590,250	188,375	41,93	2357,75	748,13	8764,96	856,96	3341,83
	σ	*11,246*	*932,280*	*397,347*	*13,36*	*2443,73*	*654,53*	*6496,77*	*815,37*	*2504,01*
2005	$\bar{x}$	22,090	638,125	216,292	57,12	2462,33	780,63	9120,92	893,63	3477,04
	σ	*33,196*	*910,254*	*464,886*	*16,32*	*2569,09*	*694,22*	*6874,83*	*861,26*	*2640,22*
2006	$\bar{x}$	198,189	932,458	255,208	68,25	2571,33	828,04	9576,42	941,83	3662,38
	σ	*913,165*	*1866,737*	*559,582*	*36,01*	*2662,75*	*739,65*	*7241,68*	*911,20*	*2758,36*
2007	$\bar{x}$	16,995	1006,917	318,833	82,15	2659,83	861,29	9748,21	981,29	3787,21
	σ	*21,163*	*1211,304*	*696,743*	*26,13*	*2733,39*	*767,95*	*7408,63*	*944,83*	*2837,06*
2008	$\bar{x}$	11,454	763,125	347,792	88,00	2753,67	917,58	10093,67	1030,54	3893,75
	σ	*27,083*	*1229,744*	*768,183*	*24,88*	*2841,13*	*822,44*	*7849,18*	*1009,73*	*2942,98*
2009	$\bar{x}$	27,638	614,625	386,250	101,83	2863,58	990,08	10532,38	1101,58	4004,58
	σ	*78,106*	*696,583*	*873,994*	*32,81*	*2944,42*	*878,31*	*8281,82*	*1073,08*	*3037,93*
2010	$\bar{x}$	20,502	438,792	452,083	107,60	3017,67	1056,17	10985,92	1150,13	4118,46
	σ	*60,247*	*618,721*	*1036,774*	*35,02*	*3106,86*	*935,42*	*8677,81*	*1101,76*	*3109,33*
2011	$\bar{x}$	3,772	408,875	469,167	111,39	2937,63	1147,96	10677,38	1177,29	3913,67
	σ	*5,338*	*663,836*	*1080,327*	*35,55*	*2949,71*	*1061,65*	*8347,06*	*1122,25*	*3027,10*
2012	$\bar{x}$	44,765	336,750	527,250	120,36	3040,25	1238,71	11024,17	1237,42	4135,38
	σ	*135,874*	*506,581*	*1220,226*	*35,50*	*3086,66*	*1136,80*	*8784,13*	*1192,11*	*3167,06*
2013	$\bar{x}$	7,328	100,458	537,167	121,96	3181,88	1352,42	11497,83	1312,21	4232,96
	σ	*26,384*	*172,713*	*1241,537*	*35,57*	*3180,83*	*1208,19*	*9251,14*	*1274,51*	*3207,01*
Total	$\bar{x}$	35,964	583,038	369,842	90,06	2784,59	992,10	10202,18	1068,29	3856,73
	σ	*293,820*	*1003,769*	*874,543*	*39,50*	*2818,66*	*911,75*	*7861,28*	*1030,57*	*2889,08*

[5] The distance decay weights reflects the impacts of distance (rather contiguity), and the choice of a distance cut-off is based on the average nearest neighbor distance calculated by the Average Nearest Neighbor tool in Arc-gis software.

IV.3. Econometric Results

The econometric model considered in this study is a model inspired from Glaeser et al. (1992), Henderson et a. (1995), Altzinger and Bellak (1999), Catin et al (2007) and Karray and Driss (2009), extended to include spatial and time interactions between spatial unities, ignored in past studies, by adopting a spatial panel model (Elhorst, 2010; Elhorst, 2014). The advantage of the spatial time panel model is that it can detect the regional spillover effects on employment opportunities created by FDI. The spillover effects on employment opportunities created by regional foreign direct investment are explained by, the initial spatial repartition of foreign firms, the regional specialization index for five sectors,[6] the regional diversity index and an indicator of telecommunication infrastructure development. The regional spillover effects are detected through the introduction of a spatially lagged dependent variable and independent variables:

- **Specialization Index**

This index considers share of the sector *i* ($Firms_{i\ region}$) in total number of firms in the region r ($Firms_r$) against the share of the total number of firms in the sector i ($Firms_{in}$) on the total firm number in the national level ($Firms_n$).

$$concentration\ index = \frac{Firms_{i\ region}/Firms_{region}}{Firms_{i\ national}/firms_{national}}$$

This index gives the relative weight of each specific sector in the region compared to the national level. This index increases as the sector has an important effect at the regional level. Specialization will have a positive effect on regional economic growth as externalities are among the industries (Glaeser et al 1992).

- **Diversity Index**

The diversity index used in this study is The Hirschman-Herfindahl index (Herfindahl 1950 and Hirschman 1964):

$$HHI = \sum_{i=}^{s} \left(\frac{Firms_{ir}}{Firms_r - Firms_{ir}}\right)^2$$

The HHI index is the sum of the squared sizes of the sectors considered in the study in the region *r*, where sector size is expressed as the ratio of firms in sector *i* in region *r* relative to the total aggregate firm number of other sectors in region *r*. For this index, sector concentration is considered to increase with the value of the index. The value of the HHI provides an indication of the level of concentration, with the maximum value corresponding to the case of the monopoly, and the minimum corresponding to perfect competition. Hence, the lower the value of the (HHI), the higher the diversity in the region.

- **Télécommunication Infrastructure**

Following an important stream of empirical literature that consider the impact of telecommunication on regional growth Kormendi and Meguire (1985), Norton (1992) Madden and Savage (2000) and Torero et al (2006), available data on telecommunication infrastructure expressed telephone and mobile phone density by 100 habitant is used to analyze the spillover effect of technological regional development on employment.

[6] Only data on these five sectors, which regroup 80% of the total firms, can, be flowed over the period 2004-2013, because National Nomenclature Activity used to classify firms by their activity sectors' has been changed in 2009.

IV.4 The Estimated Equation

To analyze the impact of FDI; regional industrial structure and the level of telecommunication infrastructure, on regional employment opportunities created by FDI flows and the possible spillover effects, a spatial time panel estimation procedure (Lesage and Pace, 2009; Lee and Yu, 2012 and Elhorst, 2014) is applied to estimate the following empirical equation:

$$Lemp_{it} = \delta\, w_{it}\, Lemp + \mu_i + \beta_1 Lfd_{it} + \beta_2\, Lent_{it} + \beta_3\, spinndex\_manuf_{it} + \beta_4\, spindex\_const_{it} + \beta_5\, spindex\_commerc_{it} + \beta_6\, spindex\_serv_{it} + \beta_7\, spindex\_transpin_t + \beta_8\, div\_index_{it} + \beta_9\, tel\_densit_{it} + \gamma_1\, w_{it}\, Lfd_{it} + \gamma_2\, w_{it}\, Lent_{it} + \gamma_3\, w_{it}\, spindex\_manuf_{it} + \gamma_4\, w_{it}\, spindex\_const_{it} + \gamma_5\, w_{it}\, spindex\_commerc_{it} + \gamma_6\, w_{it}\, spindex\_serv_{it} + \gamma_7\, w_{it}\, spindex\_transpin_t + \gamma_8\, w_{it}\, div\_index_{it} + \gamma_9\, w_{it}\, tel\_densit_{it} + \varepsilon_{it} \quad (2)$$

ε_{it} is a white noise

i=1,…, 24 and t=2004,…, 2013

lEmp : log of the regional employment created by the foreign direct investment.

lFdi : log of the foreign direct investment

lFent : log of the foreign enterprise number in region i

spindex_manuf : regional specialization index of manufacturing sector

spindex_const : regional specialization index of construction sector

spindex_commerc: regional specialization index of commerce sector

spindex_serv: regional specialization index of restaurants and hotel services sector

spindex_transp regional specialization index of transportation sector

div_index : the diversity index

tel_densit: regional telephone and mobile phone density.

*W*Lemp;W*lFdi;W*lFent;W*spindex_manuf;W*spindex_const; W*spindex_commerc;*

*W*spindex_serv; W*spindex_transp; W*div_index; W*tel_densit* are spatial lags of the dependent and the independent variables.

IV.5. ESTIMATION RESULTS

The estimation results of the equation (2) are presented in table 1. Direct regional effects, indirect or spillover regional effects and total effects of the independent variables are presented in table 2. Statistic tests of the performance of the SDM against the more simplified lag or error model are performed. The hypothesis that the spatial and time fixed effects are jointly not significant is tested; the rejection of this hypothesis validates the performance of the spatial time fixed effect specification.

Table 2

	Spatial Time Fixed Effect		Spatial Time Random Effect	
Variable	**Coefficient**	**z-Probability**	**Coefficient**	**z-Probability**
lFdi	***0,336561	0,000002	0,435699	0,000000
lFent	***-1,785369	0,004147	0,093408	0,710423
spindex_manuf	1,854016	0,665353	2,531339	0,021491
spindex_const	0,209386	0,904887	-0,49234	0,582194
spindex_commerc	-1,499247	0,871371	-6,948254	0,070322
spindex_serv	***-6,944326	0,035987	0,047488	0,95631
spindex_transp	-2,220347	0,419763	-0,397338	0,720859
div_index	***30,280242	0,00847	19,782964	0,039887
tel_densit	-0,003402	0,62794	-0,001112	0,86273
W*lFdi	**0,287815	0,031038	0,338039	0,009924
W*lFent	-0,943649	0,423049	0,133401	0,766173
W*spindex_manuf	**20,36213	0,034559	1,30322	0,465678
W*spindex_const	**10,76879	0,024271	0,394352	0,841204
W*spindex_commerc	-7,980365	0,689645	-7,283142	0,321147
W*spindex_serv	-10,579182	0,239736	4,218195	0,201992
W*spindex_transp	1,975743	0,756497	0,469027	0,719925
W*div_index	**88,734115	0,021048	8,159591	0,754113
W*tel_densit	**0,042161	0,016883	0,006187	0,636918
W*dep,var,	-0,075257	0,422301	-0,123994	0,160497
teta			0,736698	0,000000
R-squared	0,8103		0,7537	
log-likelihood	-398,08333		-432,3664	
Wald_spatial_lag	**19,7638	0,0194	26,9326	0,0014
LR_spatial_lag	***22,8521	0,0065	23,5677	0,005
Wald_spatial_error	**19,1433	0,024	25,3979	0,0026
LR_spatial_error	**20,9928	0,0127	20,9639	0,0128

The * denotes p < 0.1, the ** denotes p < 0.05, and the *** denotes p < 0.01.

Table 3: Direct, Idirect and Total Effects

	Direct	T-Prob	Indirect	T-Prob	Total	T-Prob
lFdi	***0,3363	0,000102	*0,2106	0,059177	***0,5469	0,000381
lFent	***-1,7553	0,008701	-0,6379	0,511556	**-2,3932	0,047375
spindex_manuf	1,5718	0,724638	*16,119	0,05375	**17,6908	0,03984
spindex_const	0,0533	0,971401	**8,2716	0,039412	**8,3249	0,046382
spindex_commerc	-0,8282	0,856306	-6,6365	0,703588	-7,4647	0,596665
spindex_serv	*-6,8123	0,060095	-7,6131	0,29159	*-14,4253	0,084598
spindex_transp	-2,1269	0,408843	1,7219	0,758593	-0,4049	0,951945
div_index	**28,9235	0,017783	**68,6036	0,040065	***97,5271	0,009739
tel_densit	-0,0039	0,557721	**0,0329	0,027537	**0,029	0,04339

The * denotes p < 0.1, the ** denotes p < 0.05, and the *** denotes p < 0.01.

Table 4: LR and Hausman Specification Tests

Test	LR	df	p-value
Hausman test-statistic,	***457,149	19	0,0000
LR-test joint significance spatial fixed effects	***70,6907	24	0,0000
LR-test joint significance time-period fixed effects,	***28,5173	10	0,0015

The likelihood ratio (LR) and the Wald test of the null hypothesis that the spatial lag or the spatial error model, describe the data better than the SDM model, reject both this hypothesis [LR spatial lag model = 22,8521; p-value= 0,0065] and also pointed to the SDM model.

The LR test performed to test the null hypothesis of the joint insignificance of the spatial fixed effects, indicate that this hypothesis is rejected to consider a significant fixed effect in the estimated model [LR=70, 69; p-value = 0,000], the same result is obtained for the fixed time effects [LR=28, 51; p-value = 0,001].

Hausman test of the fixed effect versus the random effect is performed to determine whether the fixed effect model or the random effect model is more efficient (Baltagi 2005). Hausman test result rejects the random effect in favor of the spatial time panel fixed effect.

These test results indicate that the interpretation of the estimation results should be based on the fixed effect model estimation. The coefficients of the spatial Durbin model do not represent the marginal effect of a change in independent variable level on the dependant variable, "The reason that the direct effects of the explanatory variables are different from their coefficient estimates is due to the feedback effects that arise as a result of impacts passing through neighboring states and back to the states themselves".[7] These feedback effects are partly due to the coefficient of the spatially lagged dependent variable W*Lemp, and partly due to the coefficient of the spatially lagged value of the explanatory variable itself. Table 2 reports the direct, indirect and total effects estimates and t-probabilities.

The estimation results show that the variable Lfdi has a positive and significant coefficient for the two models. Accordingly, FDI would have favored domestic employment; regional FDI has a direct positive effect on regional employment opportunities. The increase of the FDI in neighboring regions increases the employment opportunities in such region and the increase of FDI in a region increases the employment opportunities in nearby regions.

Direct and total effects of regional localization of existing foreign firms are negative and have a significant effect on regional FDI employment. These findings can be explained as foreign firms tend to provide higher wages to workers than domestic firms, particularly in developing countries[8] (Aitken and al, 1996; Lipsey and Sjöholm, 2006). The prevalence of high wages in a specific region pushes new foreign firms to locate in regions with more competitive wages. Ayadi and Matoussi (2014) show that the localization choice of Tunisian firms is characterized by the fact that growth in the number of firms is higher where the initial number of firms is low. Following these findings, this study concludes that regions with an initially high number of foreign firms, leading to greater competition, experience higher wages. This suggests that competition might be a deterrent to attracting FDIs and employment opportunity creation.

Indirect and total effects of the industrial manufacturing and construction specialization indexes are positive and significant. These results indicate that employment opportunities are created by an FDI increase in regions surrounded by regions with high spatial concentrations of firms in the manufacturing and construction sectors. These results confirm the existence of MAR spatial externalities (Glaeser et al, 1992), where nearby regions benefit from the spatial diffusion of knowledge spillover. These results are in line with the past empirical studies of (Bun and Makhloufi, 2007; Henderson, 1997; Karray and Driss 2009; Amara and Ayadi, 2014 and Ayadi and Matoussi, 2014). The positive effects of specialization can be explained by the local industrial structure in Tunisia, which is dominated by small firms with relatively labor-intensive production (The textile industries), located in regions where they can benefit from proximity to other firms operating in other sectors.

[7] Elhorst 2014, page 65.

[8] Aitken et al. (1996) In their study for Mexico, the US and Venezuela, show that average wages in foreign-owned plants tend to be about 30% higher than in domestic plants.

Direct and total effect of the spatial concentration of service activities like restaurants and hotels has a negative effect on employment created by FDI, this result shows that FDI is not oriented to these sectors and regions with high concentration of service activities are less attractive to regional FDI.

The diversity index indicates that direct, indirect and total effects are positive; this result shows that employment opportunities created by FDI are higher in regions with low sector diversity than in regions with high sector diversity. According to results revealed by the specialization index, FDI is oriented to regions monopolized by the manufacturing and construction sectors.

The telecommunication density variable used as a proxy of the level of telecommunication infrastructure development (Wu, 2012), has a weak direct negative effect on FDI employment. The indirect and the total effects of this variable are strongly positive, indicating the existence of positive externalities of neighboring regions with high levels of telecom infrastructure on employment opportunities in a specific region.

V. CONCLUSIONS AND POLICY IMPLICATIONS

One of the main objectives of the Tunisian government is the promotion of FDI, which contributes to the reinforcement of national and regional growth, the creation of new employment opportunities and the reduction of regional disparities. In order to help policy makers achieve these objectives, an empirical analysis is conducted to analyze the impact of FDI on regional employment opportunities, taking into consideration the regional factors that explain their spatial spreading.

A spatial panel SDM model is estimated to detect the direct; indirect or spillover and total effects of FDI, the intra-regional sector's structure, such as the specialization in economic sectors, and the diversity of sectors and the telecommunication density infrastructure level. FDI has a positive direct effect and a positive regional spillover effect, inducing a total positive effect on employment. Regional sector specialization indexes indicate that the spatial clustering of manufacturing firms and construction sector firms; exert a positive spillover effect on employment in nearby regions. Tunis is the governorate that highly attracts FDI, and which has a low index of specialization in the manufacturing and the construction sectors, exert a positive spillover effect on Ben Arous; Ariana and Manouba the nearby regions with higher specialization levels. Kairouan, the new emergent FDI attractive governorate, exerts a positive spillover effect on the nearby governorates Sousse and Sfax, which have a high specialization level.

Governorates specializing in hotel and restaurant services, such as Jendouba, Zaghouan and Medenine are less attractive to FDI.

The positive direct effect; spillover effect and total effects of the diversity index imply that employment opportunities tend to be created in governorates with fewer sectors' diversity.

Telecommunication infrastructure development has positive externalities on employment in nearby regions that become more attractive for FDI. This result consolidates the actual policy orientation to improve the basic infrastructure, like transport and telecommunication networks in interior regions in order to raise their FDI attractiveness.

In lights of these empirical findings, it's recommended that regional authorities revise the incentive system related to the promotion of high employment creative FDI, essentially in the service sector, in particular through the adaptation of the regional human capital to the foreign firms' supply needs, especially in service activities. The negative effect of

regional sector' diversity prompts authorities to substitute actual FDI flows that are oriented to finance the acquisition of existing companies, in particular telecommunication, public companies (Alaya, 2006) for the creation of new high value-added activities.

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APPENDICES

Appendix 1: Regional Descriptive Statistics of Variables

Table 5

Region		FDI	Employ	Foreign _Firms	Tele_Des	Firms_ Manufat	Firms_ Constrc	Firms_Co mmerce	Hotel Restaurat	Transport
Ariana	$\bar{x}$	13,46	925,80	851,00	110,50	4542	2179	13988	1474	5219
	σ	16,06	1043,67	346,61	28,57	555	464	1806	289	829
beja	$\bar{x}$	16,95	697,90	35,70	71,81	1029	699	7056	624	2991
	σ	40,49	1754,23	6,43	22,21	97	78	553	69	285
ben arou	$\bar{x}$	91,75	1324,50	547,90	97,05	4764	1847	14994	1570	6207
	σ	176,61	767,48	189,87	26,54	665	365	1975	297	817
Bizert	$\bar{x}$	28,51	1318,30	399,20	81,14	2858	821	12792	1353	4481
	σ	20,52	858,86	112,63	21,29	283	100	904	199	401
gabes	$\bar{x}$	3,31	93,00	10,00	103,80	1808	706	7308	639	2460
	σ	6,04	118,09	3,02	39,88	105	129	197	69	120
gafsa	$\bar{x}$	3,13	152,40	15,70	82,99	968	471	5962	456	1174
	σ	6,11	369,91	4,19	27,00	61	109	351	43	70
jendouba	$\bar{x}$	3,36	161,90	37,20	59,36	1059	676	7090	881	3488
	σ	4,34	209,92	9,69	17,56	88	80	264	100	198
kairouan	$\bar{x}$	51,30	517,60	44,40	63,09	1593	726	8972	669	4986
	σ	107,35	653,41	15,61	24,51	103	128	546	100	580
kassrine	$\bar{x}$	2,37	27,40	19,00	61,46	1078	716	6835	480	2473
	σ	4,69	54,13	1,49	25,41	86	97	229	52	125
kebeli	$\bar{x}$	0,12	4,40	3,40	94,12	618	307	3505	299	1449
	σ	0,38	13,91	1,07	48,20	25	78	100	41	97
kef	$\bar{x}$	0,34	50,60	43,90	81,05	865	410	5261	554	2616
	σ	0,75	122,59	3,75	28,20	28	27	250	19	114
mahdia	$\bar{x}$	1,05	168,20	60,90	77,08	2053	575	8747	876	4052
	σ	1,30	217,79	16,44	22,49	171	112	597	127	363
manouba	$\bar{x}$	4,06	315,70	143,70	87,10	2054	683	9851	782	3992
	σ	6,39	355,36	45,55	24,17	312	135	973	126	706
mednine	$\bar{x}$	0,50	11,00	74,40	127,33	1933	648	9111	1141	3277
	σ	0,94	13,06	19,18	67,84	183	237	822	171	249
monastir	$\bar{x}$	15,80	1394,00	544,00	96,64	4617	1133	11115	1041	4918
	σ	18,38	897,01	128,26	17,08	456	300	1267	121	381
nabeul	$\bar{x}$	21,57	1611,40	731,00	85,84	5934	1613	18495	2490	4325
	σ	17,24	1091,87	214,49	17,04	667	329	2310	344	258
sfax	$\bar{x}$	17,65	408,70	160,60	96,36	9646	2211	20009	1690	9038
	σ	40,23	346,62	57,59	19,85	847	627	2160	271	853
sidi bou zid	$\bar{x}$	0,18	46,00	10,20	60,13	1035	294	5674	419	2364
	σ	0,32	128,95	3,16	24,48	102	75	472	83	100
siliana	$\bar{x}$	0,74	32,90	37,50	60,26	609	350	3967	351	1377
	σ	1,18	40,18	4,40	20,87	73	115	289	43	67
sousse	$\bar{x}$	64,35	1415,90	884,40	125,46	4671	1973	15929	1814	5123
	σ	114,80	943,60	346,54	27,77	800	516	2582	306	439
tatawin	$\bar{x}$	0,17	2,10	4,30	79,07	559	323	2667	214	589
	σ	0,54	5,67	0,67	37,48	58	70	179	40	62
tozeur	$\bar{x}$	0,04	6,10	9,30	137,94	509	225	2660	292	777
	σ	0,11	16,09	3,89	60,00	55	31	172	22	62
tunis	$\bar{x}$	494,95	2053,60	4046,90	148,79	11117	3952	39320	5071	13937
	σ	1404,68	2491,04	1481,22	43,48	741	734	3511	685	769
zaghouan	$\bar{x}$	27,45	1253,50	161,60	73,05	911	273	3546	460	1251
	σ	27,05	712,79	34,25	20,51	97	41	209	68	82
Total	**$\bar{x}$**	**35,96**	**583,04**	**369,84**	**90,06**	**2785**	**992**	**10202**	**1068**	**3857**
	σ	**293,82**	**1003,77**	**874,54**	**39,50**	**2819**	**912**	**7861**	**1031**	**2889**